## Cam Checker: Quick Start

The Cam Checker will display cam data on it's LCD screen. There are several options which you can select to customize the logger for your particular needs.

The screen features are shown below:





#### Setting up your Logger for the First Time

1) Press Options, then Reset Defaults to restore all the logger's settings to their standard settings and use right side buttons to choose Yes, then press Select button. (NOTE: Once you have set up your logger, do **NOT** Reset Defaults as you may loose some special settings you like.)

readings for the Profile File.

2) Press Options, then Calibration. Choose Lift Sensor 1 and Lift Sensor 2 and enter the calibration numbers below. These are typically written on the side of the sensors. Connectors for the Lift Sensor s are marked by colored shrink tubing. The "Dead Band Cts" is for the rotary sensor. The calibration for the Pressure and Rotary sensors are not critical. It is recommend you use the defaults loaded by pressing "Reset Defaults".

 Lift Sensor 1 (red) *		Lift Sensor 2 (yellow) *	These calibration numbers
 Pressure (green)	<u> </u>	Rotary (blue)	are typically already entered
 Dead Band Cts			by Performance Trends.

Scroll through the choices, then press the Select button when your selection is being pointed to. Then press Back button (upper left) to return to the list of Options.

\* Numbers written on lift sensors will have 3 digits, like 344. When you choose a calibration number in logger, it will put ".000" in front of it, so 344 on lift sensor gets entered as .000344.

3) In Options, click on Valve Train, then Edit Template. Here you can set the Rocker Ratio and Lash you wan the program to use for calculating what the cam lobe specs are (typical of most cam card specs) when you measure what the valve retainer is doing. That means you have placed the linear sensors on the valve retainer. NOTE: If you place the linear sensors directly on the tappet or pushrod (components which move directly with the cam lobe), you should set 1 for the Rocker Arm Ratio and 0 for the Lash. You would also set 1 for the Rocker Arm Ratio and 0 for the Lash if you want to measure what the valve is doing, instead of the cam lobe. (updated Jan 16, 2020)

- 4) Click on Back 2 times to return to the Main Screen. You have set the most critical parameters to obtain good results.
- 5) To run a test, you must install the 4 sensors on the engine:
  - Screw the pressure sensor connection into the cylinder you will be testing.
  - Install the lift sensors on the retainers (or pushrod or tappet, or some other item which moves with the valve motion). Fig 1, also showing optional disk magnet on steel retainer to make a larger "target".
  - Install the rotary sensor on most any item which turns with the engine crankshaft, like a pulley or belt. Fig 2.
- 6) Crank the engine over with the starter for a few seconds, then press the Record button. The screen will show "Recording Data". Once enough data has been recorded, the screen will show "Calculating". When finished, the screen will show the Intake Centerline. By pressing the "InExDet" button in the lower left you can scroll through Intake Centerline, Exhaust Centerline and Details (like lift, duration, events, etc.),
- 7) You can upload these results to a PC via the USB cable and the free Performance Trends software. Check the program's help screens and documentation for more information on this program.

#### Notes:

- You will charge your logger battery via the USB cable to any computer's USB port.
- You can upload your recorded data to the free Cam Checker software on Performance Trends website or from CD.
- The logger will shut down automatically if it senses it is not moving and/or the buttons have not been pressed, to save battery power.
- The LCD backlight will shut down automatically if it



senses it is not moving and/or the buttons have not been pressed, to save battery power. The time to keep the light on can be modified in the Options menu.

- The logger will mark each recorded data set with date and time. You must set this clock when you first get your logger. The time and data are only available when you upload the records to the PC. These features are available only by the free software.
- If you press power switch on side of logger to turn it off to save battery power (which also reboots the microprocessor), the screen may still stay on if you have USB power plugged in. You will loose the cam profile data (all raw readings) for the last profile measured when you reboot.

Tips on Hardware Installation:

- The most likely reason for data not repeating is the rotary sensor slipping. Be sure it is firmly pressing on the belt or pulley. Performance Trends offers spring loaded brackets which can reduce slipping.
- Just hand tighten the pressure sensor into the spark plug hole. A *minor* leak is not critical.
- You want the bracket holding the lift sensor to be very stiff and secure. If it is bending or moving slightly, that can easily change the lift and readings .030" or more, which also affects duration and events measurements.
- If you are measuring a cam with hydraulic followers, the high force of the valve springs can force the lifters to leak down, changing the effective lash and the measured results. The solution is to measure directly on the pushrod with the rocker arm removed, or replace the followers on the lobes being measured with solid followers. If you go directly to the pushrods, you will likely need additional springs to keep the follower in contact with the cam. If you stay with hydraulics, it helps to crank engine over many revolutions before measuring to get lifters pumped up.
- If you are only interested in cam timing (centerlines), you can place the lift sensors on the rockers (especially if the rocker arms have large flat surfaces like those pictured above.
- You can place large disk magnets on the valve spring retainers (if they are steel) to provide a large flat surface for the lift sensors.

#### **Cam Checker Options Menu Operation**



#### **Cam Checker Options Menu Operation, cont**

#### Explanation of some menu options:

**Calibration, Lift Sensor 1, Lift Sensor 2, Pressure, Rotary, Dead Band Cnts** This is where you can enter the calibrations for your particular sensors. The Lift Sensor calibrations are critical to enter correctly for all data except cam timing. Pressure and Rotary sensors are not critical at this time; use the default settings. Dead Band Counts (the counts missing in the rotary encoder as the values drop from maximum to minimum when the rotary encoder goes beyond a full revolution) is somewhat critical and is typically 225 (the default).

Valve Train, Current Template Displays the current template name of template being used. A "template" is a combination Intake and Exhaust Rocker Arm Ratio and Lash Options (4 values). These numbers are used to calculate the cam's actual *lobe* values if you measure what the *valve* is doing. If you place the lift sensors directly on the follower or pushrod which is directly on the lifter, you should use a template where the rocker ratios are 1 and the lash is 0. The Template names can only be changed in the PC software.

Valve Train, Open Template Lets you pick a different template.

**Valve Train, Edit Template** Lets you change the Rocker Ratios or Lash settings. This can also be easily done with the PC software.

**Procedure, Units** Lets you change between inches and mm units. Note: The lift sensor calibrations are always in inches.

**Procedure, Lift Events** Lets you set the lift where duration and events are determined. Note: These are calculated as what is happening on the cam lobe, like most cam grinders report. When you measure the valve motion, you need the correct template settings of rocker ratio and lash.

**Procedure, Step Size** Lets you set the change in rotary sensor bits to change before a new reading is taken. Depending on the RPM of the rotary sensor, many times the records have much bigger steps then specified here. This minimum step would only be used if the RPM was very slow. (mostly for future options)

**Procedure, Test Method** Lets you set the change the method by which the engine is being rotated. **Keep it set to "On Stand" (earlier firmware) or "TDC every 360" (v1.61 or later firmware) at this time.** These settings mean the TDC signal (like cylinder pressure) can come every 360 deg of rotation. This is what happens when the rockers are removed and the valves are not opening. Even when the valves are opening, there is typically no advantage to switching to "With starter" or "TDC every 720". In the future, we may use this setting for more details.

Data/Power, Backlight/Pwr Lets you specify options to save on the battery life.

- Backlt On With lets you specify if motion of the logger or pressing a button will turn on the backlight.
- Backlight Time Its you specify how long the backlight will stay on after being activated.
- InactivePwrOff lets you specify how long the box can have no motion or button press or USB communications before the box "goes to sleep" to save on power.
- Low Bat PwrOff lets you specify how long before the box goes to sleep when the battery power is very low.

Data/Power, Recorded Data Lets you display the results for the individual records.

Data/Power, Delete Data Lets you erase all the individual records.

**Data/Power, Raw Readings** Lets you add the data readings for the 4 sensors to the main screen display. Typically you will only display these readings is if you are troubleshooting the system.

**Reset Defaults** Puts the logger back to all factory settings. This can be very useful if you think you have made mistakes with the settings. NOTE: After this you must reinstall your calibrations. It does give you an option to save Template changes.

#### Troubleshooting with v1.60 firmware (firmware version appears on start up):

Version 1.60 firmware (June 2018) has added some features to better diagnose problems with Cam Checker accuracy, displaying "Rated Lift too Low" messages, or not producing any results at all. If you have an older versions of firmware, you still can benefit from reading through these tips. Note: Rate Lift Too Low has been replaced by the message "Pres. Thresh. Either Too Low or Too High".

Pres. Thresh. either Too Low or Too High. Press Any Button To Continue

The most likely reason for the logger to just say "Recording" and never get to "Calculating" screen, or getting the new "Pres. Thresh. Either Too Low or Too High"

message is the cylinder pressure is not in the range the system is expecting. This problem really started to appear when people wanted to measure valve lift directly on the pushrods, thus disabling the rocker arms. This produced a situation where cylinder pressure could get quite low because the valves were not opening to let air into the cylinder. Air just leaked out by the rings, and never really got back in. Pressures were much lower than we expected.

The system needs to see cranking pressure go above and below a certain pressure threshold. If it just stays below this limit, or never gets above this limit, errors would occur. Firmware v1.60 now lets you change this Pressure Threshold. It is available by Options, then Calibrations, then "Pres. Thresh." It is typically set to .00065, which means 650 counts. You take the setting and multiply by 1,000,000 to get the counts,  $.00065 \times 1,000,000 = 650$ .

You can view the pressure sensor counts during testing by Options, then "Data/Power", then "Raw Readings", then select "Display". Now when you press Record you will see the raw counts for the 4 sensors. Displaying Raw Readings is a helpful troubleshooting feature, as you should see all readings changing significantly as the motor turns over. If one of the readings is not changing, it



indicates that sensor is not connected, is not installed correctly, or has gone bad. If you watch the pressure sensor reading (3rd from the left), the lowest number you see should go below 650 and you should see it also go well above 650 for proper operation. Because it cycles so fast, the high number can be difficult to see exactly.

Back Calibration Value Train Procedure Data / Power Reset Defaults	Back Backlight/Pwr Recorded Data Delete Data *Raw Readin9s	Back No display ⇒Display
Select	Select	Select

Typically you want the Pres. Thresh. to be about 50-100 counts higher than the lowest Pressure Counts you see when recording data. Pictured to the right we see 584 counts, so 650 is about right. Typically you do NOT adjust this, unless you are getting no results or an error message.

# Other Errors:

Other sources of errors or inaccuracies include:

- Lift sensor brackets having too much flex.
- Rotary Sensor slipping. Performance Trends offers spring loaded brackets which can reduce slipping.
- Timing seems retarded, but is still accurate due to "slop" in the timing chain or gears putting real retard into the cam.
- The amount of rotary sensor rotation between data points can be too high or too low. If the system senses this, it will show up in the warning message as shown in the lower right. If it does show up, go into the "Procedure" option, then "Step Size" and change it to either a bigger or smaller step size. Just a 5 increment (1 step in this option) change is typically enough. This was added with Firmware v 1.64.

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Options

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+]

Pressure

Sleep

Counts

#### Flex in brackets



sensor can move around on the target.

Cam Checker.pub page 6 Rotary Sensor Slip

If the rotary sensor is slipping on the belt or pulley, you will get errors in events and centerlines. Typically it is better to put the rubber rotary sensor wheel on a belt, because it has some "give" (compliance) to it, like a spring. If things move a little bit, the wheel is still rubbing on the pulley.

However, if you put the rubber wheel on something solid, like the damper, there is no give. If something moves even slightly it is the difference between turning



us to verify readings at our shop.

the sensor wheel, or opening up a slight gap and not turning the sensor wheel.

One way to check if this is happening is to watch the "RSCal" number in the results. Is is a measure of how many crank degrees for every count from the sensor. It depends on pulley diameters, wheel diameter, etc. It is difficult for this number to be lower than it should be. However, if it is even slightly higher than normal, it is indicating slip. The figure at the left shows it to be .0278, or .0278 crank degrees for every digital count from the sensor. Let's say you typically get this number how you mount the sensor on your 604 crate motor. If now you are getting .0280, that could be enough to throw off you results like duration and centerlines several degrees. However, with a totally different motor, pulleys, etc, you should expect this RSCal number to be different.

#### **Bad Data**

Sometimes the system just gets "confused" and will produce strange results. Firmware 1.60 now produces some "raw data" results, showing the Maximum and Minimum lift counts for the 2 lift sensors when calculating results. For example, in picture to the right, the first lift sensor went from 3179 to 2147 counts, or about a 1000 count difference. The count difference is typically in the range from 500 to 2000. If you see one of these numbers of say, 10,000 or -10,000,

InExDet

you know the results will be wrong, so run the test again. Typically this type of problem is from not having the "Pres. Thresh." set correctly.

#### **Cam Timing Seems Retarded**

Results, especially cam centerlines, will be retarded from what you expect due to the "slop" in the timing system. Our experience is they can be a couple degrees more retarded than what you would get from careful measuring with a degree wheel and dial indicator. This is true even if you are careful to always rotating the crank in the proper "running" direction. When cranking the motor with the starter, the continuous load of the valve springs on the valve train may put more load (and therefore more stretch) into the timing chain or belt. This stretch may be more when the engine is cranking over faster than what you turn it by hand.







#### Cam Checker Software - Quick Start

Install the Cam Checker software following the paperwork with the CD.

Then you need to get the Cam Checker to "talk" to your computer. If you already have some Performance Trends USB type loggers, plug in the USB cable to the logger. It will likely say "Found new hardware" at lower right corner of computer screen. Wait 30-60 seconds and see if computer comes back and says your USB Hardware should be working. If it does not say that, unplug the USB cable and wait about 20 seconds. Also check page 15 for more info.

Insert CD which contains the Cam Checker software and it will start up the Installation Wizard. When it starts up, click on the Install DataMite Utilities and then select either "Install 64 bit..." or "Install 32 bit..." to install USB drivers. Unless you know you have a 32 bit system, most all newer computers (Vista, Win 7, Win 8) are 64 bit so choose "Install 64 bit...". Follow program instructions. When finished, plug in the USB cable and see if it says your Hardware should be OK.

😤 Performance Trend	s Installatio	on Wizard			
Options Movies Pr	oduct Compar	isons Visit our Website: v	www.performan	ancetrends.com	
Engine Performance P	rograms	Drag Racing Tools		Data Logger Programs	
Install This Program	View	Install This Program	View	Install This Program View	
Engine Analyzer	Brochure	Drag Racing Analyzer	Brochure	Dyno DataMite Brochure ×	:
Engine Analyzer Plus	Brochure	Drag Race Analyzer Pro	Brochure	Drag Race DataMite Brochure	^
Engine Analyzer Pro	Brochure	4 Link Calculator	Brochure	Road Race DataMite Brochure	
– Engine Building Tools		Practice Tree	Brochure	DataMite System Spec  Brochure	
Install This Program	View	Prelim. Race Clutch	Brochure	(Install D.ataMite.Ltbl/ties)	
	Deceluine			Install DataMite II "Box" Update Utility	
Lomp. Hatio Laiculator	Brochure	Circle Track/Road Ra	ce Tools —	Install 64 bit DataMite USB Drivers (Vista/Win 7)	
Cam Analyzer	Brochure	Install This Program	View	Install 32 bit DataMite USB Drivers (XP and earlier)	
Cam Test Stand	Brochure	Roll Center Calculator	Brochare	Fuel Economy Calculator Brochure	
Port Flow Analyzer	Brochure	Circle Track Analyzer	Brochure	Rotating Inertia Calc. Brochure	

Run the Cam Checker software and see if it communicates with the Checker. Click on Options, then Com Port and see what the software finds for possible Com Ports. Typically the Cam Checker will be the highest number in the list, so

<u>í c</u>	🖆 Cam Checker Data Logger - Performance Trends Inc. [Example]												
File	File Options Help Reg To: Jim Powers												
	Cam Checker	Templates	ments for Selected Record Refresh Grid										
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Red	cord	Time Date Lobe Int Sep CL	Exh Int Exh RateInt Int Int Exh Exh Exh RoteInt Int Exh Exh Lift CL Lift Lift Dur OpeClosDur OpeClosCalit RAFLastRAFLastCal	Lift Dea Terr Prof Cal Ban File									
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4 T	est 4 repeat	18:210/(107.107.	108.0.390.370.05247.17.949.8245.50.914.30.031.600.021.600.020.00	0.00 225 SB CP0									

choose that one. Then click on the "Read Data from Logger" button, behind the drop down menu in the screen shown above and see if it reads the data in the logger.

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If it can, it will read up to 10 records of what is stored in the logger. For only the last record, it will also read the raw data of what the cam profile looked like. This is not very precise data and is mostly used from troubleshooting the results or find bad sensors.

As you click on different rows in the spreadsheet, the comments for that row (record) are displayed at the top. If you have not entered any comments, it will be blank. Any comments you enter or change will have the changes "remembered", especially if you click the "Refresh Grid" button.

6	Cam Che	ecker D	ata L	ogg	er -	Per	forn	nan	ce T	ren	ds l	nc.	[ ]	Exan	nple	]									(		
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Export Data To Notepad Graph Profile																											
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7	Foot 2 rope		19:21	070	107 -	108	107	0.00	0.37		240.	17.E	50.4	244.	51 E	13.1	0.0	1.60	0.02	1.60	0.02	0.0	C O O	C 228	5 GB	CPI	
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2 Te	st 2 .150 lift	107.81	108.00	)	107.61	1	0.391'		0.378		0.150		188.5	6	184.79	3		sł	now i	t in	the	righ	ntmo	st c	olun	nn "F	Profile
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If you want to reduce the number of columns, choose a different "Display" option.

If you want a complete file so you can graph it, you must upload the Checker to your computer after every run. The software tries to remember what is new data and data it has already read in from the logger. It tries to make sure that if you do something unexpected, it will handle the data correctly.

A useful option under "Options" are Read and/or Reset Logger Time so each cam checker record is properly time stamped. Another is Cam Checker Templates, where you can create more templates and template names of various rocker ratios and lashes for checking engines you will commonly test.

Check the website for latest updates to the software, including assigning one test as a Baseline for comparisons with other tests like overlay graphs and comparison reports, handy for track tech inspectors.

## Assigning a Baseline Run so 2 Profiles can be Compared

Recent additions to the software (v1.1 A.012 or later) include the ability to do overlay graphs with a test you have designated as a "baseline" for comparison. This is very handy if you are checking to see if the cam in 1 vehicle is matching the cam in another, like for track inspection.

To compare 2 different profiles, you must upload them from the Cam Checker to the software in a computer. Only the last profile measured can be uploaded. If the software has the 2 profiles loaded, assign one as the baseline as shown to the right.

You will get a message shown below. Click on a test with a "Profile File" like row 10 shown below. It will now

🔏 Ca	m Checker D	ata Logge	er - Perfo	mance Tr	ends Inc.	[ Examp	le 13 recor	ds ]		
File (	Options Help Graph Scale Graph Line Thi Baseline (comp	Reg To: ckness	Jim Powers	ments for (	Selected F	Record	Refresh G	irid		
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Di	Com Port						1			
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1 68 r	nustang may 1	107.93	108.76	107.09	0.376"	0.377"	0.050	249.60	248.72	CP0000014
2		107.92	108.58	107.26	0.375"	0.378"	0.050	248.87	249.70	
3 68 1	dustang with	107.71	107.48	107.94	0.375"	0.379"	0.050	249.54	248.43	
4		108.52	110.06	106.98	0.375''	0.377''	0.050	249.54	250.97	
5		107.76	108.17	107.34	0.375"	0.378"	0.050	249.63	248.15	
6		107.10	107.41	106.79	0.375''	0.378''	0.050	256.39	247.65	
7 Tes	t with .200 lift	107.94	107.56	108.32	0.391"	0.377"	0.200	163.71	158.36	CP0000002
8 Tes	t 2 .150 lift	107.81	108.00	107.61	0.391''	0.378''	0.150	188.56	184.79	
9 Tes	t w .100 lift	107.88	107.56	108.20	0.391''	0.377''	0.100	216.43	210.92	
10 Te	st 4 repeat	107.84	107.68	108.00	0.392"	0.377"	0.050	247.85	245.27	CP0000001
11 Te	ist 3 repeat	108.11	107.62	108.59	0.390''	0.377"	0.050	249.29	245.51	
12 Te	ist 2 repeat	108.00	107.22	108.78	0.391''	0.377"	0.050	249.25	244.77	
13 Te	ist 1	107.96	108.01	107.91	0.391''	0.377"	0.050	248.57	244.95	CP0000000
<u> </u>		1								

#### Cam Checker

Now go directly to the 'Grid' of data files and pick one with a 'File' and click on it (in any column). This file will now be selected as the 'Baseline' graph to be included with another graph you have selected.

Graph Profile

Display Basic+Cam File Nam 💌

show 10 with an asterisk \* marking it as the baseline profile. Then go and click on a different test with a Profile File, perhaps the one in row 1 called "68 mustang may 1" to highlight it in blue. Then click on the "Graph Profile" button shown to the right.

The graph on the next page shows the baseline test graphed in black called "10 Test 4 repeat" with the current test being called "1 68 mustang may 1". You can see that the exhaust profiles are fairly similar (the baseline being a little smaller on the closing profile) and the baseline intake being advanced some and higher

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8 Fest 2 .150 lift	107.81	108.00	107.61	0.391"	0.378"	0.150	188.56	184.79	
9 Test w .100 lift	107.88	107.56	108.20	0.391''	0.377"	0.100	216.43	210.92	
10 * Test 4 repeat	107.84	107.68	108.00	0.392"	0.377"	0.050	247.85	245.27	CP0000001
11 Te epeat	108.11	107.62	108.59	0.390"	0.377"	0.050	249.29	245.51	
12 Test 21, eat	108.00	107.22	108.78	0.391"	0.377"	0.050	249.25	244.77	

 Cam Checker Data Logger - Performance Trends Inc.
 Example 13 records

 File Options Help
 Reg To: Jim Powers

 Read Data from Logger
 Comments for Selected Record

 Read Data from Logger
 Comments for Selected Record

 Barborn Data To Notepad
 68 mustang may 11 2017 with profile file



×

Record	Lobe Sep	Int CL	Exh CL	Int Lift	Exh Lift	Rated Lift	Int Dur	Exh Dur	Profile File
1 68 mustang may 1	107.93	108.76	107.09	0.376"	0.377"	0.050	249.60	248.72	CP0000014
2	107.92	8.58	107.26	0.375"	0.378''	0.050	248.87	249.70	
3 68 Mustang with	107.71	1. 48	107.94	0.375"	0.379"	0.050	249.54	248.43	
4	108.52	110.06	106.98	0.375"	0.377"	0.050	249.54	250.97	
5	107.76	108.17	107.34	0.375''	0.378''	0.050	249.63	248.15	
6	107.10	107.41	106.79	0.375''	0.378''	0.050	256.39	247.65	
7 Test with .200 lift	107.94	107.56	108.32	0.391"	0.377"	0.200	163.71	158.36	CP000002
8 Test 2 .150 lift	107.81	108.00	107.61	0.391''	0.378''	0.150	188.56	184.79	
9 Test w .100 lift	107.88	107.56	108.20	0.391''	0.377''	0.100	216.43	210.92	
10 × Test 4 repeat	107.84	107.68	108.00	0.392"	0.377''	0.050	247.85	245.27	CP0000001
11 Test 3 repeat	108.11	107.62	108.59	0.390''	0.377''	0.050	249.29	245.51	

lift. This type of comparison is very useful for track inspection.

Also shown are many new Graph options letting you:

- Change the graph scale. You will notice the scale of screen to the right shows profiles much larger than the standard scale of earlier program, shown in picture above.
- Change the thickness of the graph lines.
- Whether to include a baseline graph or not, and picking a test to designate as the baseline.
- Whether to include a report of the duration and events for 1 or both graphs at .050" lift increments, and

include a table showing the differences between these 2 tables (as shown to the right).

A new feature added in 1.1 A.025 in 2020 lets you easily add a GM 602 or GM 604 crate motor cam profile as the baseline in 1 click. See options screen below:

60	am Che	c <mark>ker</mark> Da	ita Logger	- Pe	rfo	orm	anc	e T	ren	ıds	Inc.	[	Gk	6	04]
File	Options	Options Help Reg To: Jim Powers													
	Graph Graph	Scale Line Thio	kness	+ +	om	men	ts for	r Se	lecte	ed Ri	ecor	Ь			9
	Baselir Compr	ne (comp ression R	arison) Graph atio	•	<b>v</b>	Cho Use	ose o 602	or C Cra	hang te M	ge Ba lotor	aselir as E	ne Gi Iasel	rapł ine	1	
	Repor	t After G	raphing	•		Use -	604	Cra	te M	lotor	as E	lasel	ine		-
Dia	Cam C Delete	hecker T Record	emplates	•	Г	Turr	n Off	Bas	seline	e Gra	aph				-
Rec	Com P	ort			xh L	Int Lift	Exh Lift	Ra Lift	Int Dur	Int Ope	Int Clo:	Exh Dur	Exl Op	Exl Clc	Rot I Cali F
1	Time/[	)ate Opt	ions	•	19	0.31	0.34	.05	210	-1.7	32.6	222	49.	-6	.10( *

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rate in	Jak Transish 17						
File Ed	iit ⊢ <u>o</u> rmat <u>V</u> ie	ew <u>H</u> elp					
Cam F	ile: 1 68	mustang mag	y 1				1
lift	Int Onen	Int Close	Int Dur	Fxh ûnen	Fxh Close	Exh Dur	
	ine open			- open			
05 O	18.0	51.4	249.4	51.9	16.5	248.4	
100	0.0	34.7	214.7	34.5	-0.7	213.8	
150	-14.1	21.9	187.8	20.8	-15.1	185.7	
200	-28.0	9.0	161.0	9.3	-28.0	161.3	
250	-42.0	-4.3	133.7	-4.7	-41.8	133.5	
300	-57.5	-20.4	102.1	-20.6	-56.8	102.6	
350	-79.0	-42.5	58.5	-42.3	-75.9	61.8	
400							
450							
00							
asel	ine File:	18 Test A	reneat				
ift	Int Open	Int Close	Int Dur	Exh Open	Exh Close	Exh Dur	
	-			•			
05 O	21.3	44.1	245.4	52.3	10.7	243.0	
100	4.1	28.4	212.5	35.5	-5.7	209.8	
150	-9.1	15.8	186.7	23.1	-19.8	183.3	
200	-22.3	3.7	161.4	10.4	-33.0	157.4	
250	-35.1	-8.5	136.4	-3.1	-46.5	130.4	
300	-49.4	-23.1	107.5	-18.7	-61.0	100.3	
150	-67.3	-40.7	72.0	-40.5	-80.7	58.8	
100							
450							
00							
iffe	rences: B	aseline: 1	0 Test 4 r	epeat -	Cam File	: 1 68 must	ang ma
	Ist Oses	Ist Class	Ist Dun			Fub Dun	
0F0	a a	-7 9		Exil open			
100	0.0 h 1	-7.3	-4.0	U.4 1 0	-5.8	-5.4	
150	5.0	-6 1	-1 1	2 3	-4.7	-2 h	
200	5.7	-5.3	6 L	1 1	-5.0	-3 0	
250	6.9	-4.2	2.7	1.6	-4.7	-3.1	
300	8.1	-2.7	5.4	1.9	-4.2	-2.3	
350	11.7	1.8	13.5	1.8	-4.8	-3.0	
400							
450							
500							
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¢							>
						In 1. Col 1	

#### New Software Features in v1.14

In June 2018 we release new features in the Cam Checker software as described below:

Under Options, you can now Delete 1 record, or a range of records for a test file.

You can now save comments for entire data file, not just individual records. A test file is a group of individual records read from the Cam Checker. You probably want to group records together, like

🚰 Cam Checker Data Logger - Performance Trends Inc. 🛛 [ c													
File	Options	Help	Reg To: Jim	Powers	_								
	Graph Graph Baselir Repor	Scale Line Thi ne (comp t After (	ckness barison) Graph Graphing	* * * *	nents for Selected Record								
 Di:	Cam C Delete	hecker Record	Templates	•	hents for Entire Data File 250 processors with ut 50 Delete 1 Record	firmurare DC							
Rec	Com P	ort			Delete Range of Record	ls P Exh Li							

a particular test session at a particular race, or all the records from a particular customer or racer's car.

For example, lets say you are going to tech several cars after a race at Onaway Motor Speedway. You would start with a new file for all these records. You click on File, then New to create a blank file as shown below.

🔁 Cam Checker Data Logge	🔏 Cam Checker Data Logger - Performance Trends Inc. [Untitled]			
Call oneoner para co65	File Options Help Reg To: Jim Powers			
File Options Help Reg To: .	Bead Data from Longer Comments for Selected Record Save Comment			
New				
Open	Export Data To Notepad			
Save	Graph Profile Comments for Entire Data File			
Save As	Display Basic+Cam File Nam	(R)		
Export Data to Notepad 🛛 🗧	Record Lobe Sep Int CL Exh CL Int Lift Exh Lift Rated Int Dur Exh D	Dur Profile File		

You start doing tests on various cars, and downloading the results to the Cam Checker software. Each test gets added as a Record, or a new line to the table (or grid) of results.

You enter "Comments for Selected Record" like "#54 Devin Jones, motor still warm", and the next record "#54 Devin Jones, motor cooled 30 min". When you are done doing all the tests on different cars at Onaway on July 22, you click on File, then Save As, and enter a file name of "Onaway July 22 2017".

#### 🚣 Cam Checker Data Logger



Comment for individual	er – Performance Trends Inc. 🛛 🛛 🔲 🖂 🔀						
records. Click on Record (in this case Record 5) to highlight it and the comment you have entered for that particular record is shown here. You can also change it to read anything you want. This was also available before this software	Jim Powers Comments for Selected Record #54 Devin Jones, feature winner, 604 crat Motor still quite warm Comments for Entire Data File Dnaway Michigan July 22, 2017 Jerry Smith inspector, Josh Peterson assist	This new area lets you save comments to describe this entire file, called "Onaway July 22 2017" for this example.					
	Int CL Exh CL Int Lift Exh Lift	Rated Int Dur Lift	Exh Dur Profile File 🔼				
1 #54 Devin Jones, 112.23	121.24 103.21 0.257" 0.267"	0.050 194.74	197.00 CP0000148.txl				
2 #54 Devin Jones, 112.06	120.98 103.13 0.259" 0.264"	0.050 195.95	194.67 CP0000147.tx				
3 * #97 Dave Johnso 112.09	121.26 102.91 0.258" 0.264"	0.050 194.92	196.14 CP0000146.txl				



### **Crate Motor Bracket**

The Crate Motor Bracket is designed for the 602, 603 and 604 GM crate motors very popular in certain classes of racing.

To install the bracket, remove the valve cover. Remove the rocker arms for the cylinder you want to test. Leave the pushrods in the lifters.

Install the bracket using the 1/4 20 thumb screw into the valve cover bolt hole between the 2 valve springs. Tighten it down firmly, being sure the 2 pushrods are seated into the spring loaded lifter

body recesses inside the bracket. It will rest on the 2 valve cover gasket "rails" on the head.

Install the 2 length sensor bodies on to this bracket. You can not use the thumb screws for the sensors because they are too long. Use the 1/4 20 button head screws which come with the bracket. The spring loaded plastic plungers of the sensors will seat into the recesses inside the bracket, on top of the lifter body.

There are adjustment slots to slide the bracket up and down to adjust for different pushrod heights.

You are now ready to test.

Install sensors into bracket.

Spring loaded sensor "plungers" extend into bracket and seat into recess on top of lifter body inside bracket.

NOTE: You may want to drop 3-4 drops of air tool oil on top of these spring loaded plungers every 10-20 tests. Note: There are slots for adjusting the individual plungers also. You may have to loosen these screws to get the bracket to slide.

> There is typically enough clearance around this screw, that you can adjust the bracket so the brace does not hit the valve cover rail.

Pushrods extend up inside bracket to fit into recesses of lifter body

Thumb screw holding bracket in place in valve cover bolt hole.

Only this "cross bar" should set on the valve cover rail.



Be sure this brace does not set on the valve cover rail, or the bracket could rock.

# **USB Driver Installation Sheet**

This sheet hits the major points for getting your data logger communicating to your computer.

**Plug in your Performance Trends USB device to one of your computer's USB ports** You should hear the USB connect sound, and your computer should say "Found new hardware".

It may ask if it should connect to the internet to find a driver. Say No, and when it asks for you for a CD, put the Performance Trends Installation CD in your computer (the same CD which contains your data loggers software).



When the Installation Wizard comes up, click on Stop at lower left corner. Wait about 60 seconds to see if the USB Driver Installation Wizard comes up.

**If it does**, then click on OK for the intro messages, then click on Stop in the lower left corner to shut it down. With the Installation Wizard gone, follow the instructions in the Found New Hardware Wizard. When complete, it should now say "Your hardware is ready to use."

**If it does NOT**, then unplug your USB cable from the computer. Remove and reinstall the Performance Trends Installation CD again. When the Installation Wizard comes up click on the "Install DataMite Utilities" button in the "Data Logger Programs" section at the upper right corner.

Choose	🖻 🗠 Performance Trends Installation Wizard										
"Install 64 bit	Options Movies Product Comparisons Visit our Website: www.performancetrends.com										
DataMite	Engine Performance Programs Drag Racing Tools Data Logger Programs										
Drivers" (for		Install This Program	View		Install This Program	View		Install This Program	√iew	F	
most new, 64		Engine Analyzer	Brochure		Drag Racing Analyzer	Brochure		Dyno DataMite	Brochure		
bit		Engine Analyzer Plus	Brochure		Drag Race Analyzer Pro	Brochure		Drag Race DataMite	Brochure		
Follow		Engine Analyzer Pro	Brochure		4 Link Calculator	Brochure		Road Race DataMite	Brochure		
program		Engine Ruilding Tool			Practice Tree	Brochure		DataMite System Spec 💌	Brochure		
instructions					Prelim. Race Clutch	Brochure		Instal DataMite I Iti	ities 1		
for installing		install inis Program	view				L	Install DataMite II "Box	" Update Utility		
USB Driver,		Comp. Ratio Calculator	Brochure	Г	Circle Track/Road Rad	e Tools	Γ	Install 64 bit DataMite I	USB Drivers (Vis	ta/W	/in 7)
accepting all		Cam Analyzer	Brochure		Install This Program	View		Install 32 bit DataMite I	USB Drivers (XP	and	earlier)
suggestions		Cam Test Stand	Brochure		Roll Center Calculator	Brochure		Fuel Economy Calculator	Brochure	Г	
if offered.		Port Flow Analyzer	Brochure		Circle Track Analyzer	Brochure		Rotating Inertia Calc.	Brochure	in	
Once		Swirl Meter	Brochure		Suspension Analyzer	Brochure		Coil Spring Tester	Brochure	ιΡ Jat	
done		Tumble Fixture	Brochure		Trans. Gear Calculator	Brochure		Click for More Programs			
installing,		Fuel Inj. Calculator	Brochure		Lap/Segment Timer	Brochure				Ľ	
click on		Engine Log Book	Brochure		Pit Stop MPG Calc	Brochure		Install 'Picked' Program	Brochure	t	
"Stop" at lower left		Valve Spring Tester	Brochure		Circle Track Log Book	Brochure		Install Adobe (tm) Reader —			
corner of the		Valve Spring Wiz	Brochure		Shock Dyno	Brochure		Install Adobe (tm) R	eader		
Installation					Chook Byno					k.	
Wizard and	0	lick on 'Movies' (top of sci	een) to play der	mo	Instration movie files of certai	in products.					
remove the	Г	Click here to in:	stall various utilit	ty .	programs for use with our Da	taMite II or III da	ata	a loggers. ONLY do this if ins	structed to by		
CD. Start up	Stop If you purchased a program, click on that product's button to install it, the Brochure button for more details.										
your software	installation sheet. You can install any of our other programs here as demos to see their features.										
and see if it											
communication now											

communicates now.

#### Cam Checker Options, Testing Motor on Stand (without starter)

To test a motor on an engine stand, you need a special rotary sensor. It is a sensor which only has 10 turns of rotation before it bottoms out (stops turning). We need this special type of sensor because when you turn the motor over by hand (bar it over), you will start and stop. The rotation is not continuous like when turning it over with the starter.

First, make the following changes to the recorder options, by pressing the Options button at the upper left of the display. Then select Calibrations and make these adjustments:

Pres Threshold set to .000240 Rotary set to .000200 Dead Band set to 5

Then back out of Calibrations and go into Procedure and make these adjustments:

Step Size set to 10 Method set to Every 360

Then back out of options and save these changes.

You will replace the pressure sensor with a linear sensor like used for the tappet lift measurement. Set this up to measure piston travel near TDC. Typically it works best if the piston pushes the sensor in about 3/4" (.75 inch) at TDC. See picture below.

Set up your rotary sensor to ride on something turning with the crankshaft. We have different size rubber wheels available depending on the diameter of the damper or pulley the sensor will ride on. You want the 10 turn sensor to turn about 2 to 2.5 rotations for every 1 rotation of the crank. See picture below



With these adjustments made above, rotate the rotary sensor backward to the start of its rotation and place it on the component turning with the crank. Press the Record button on the QCC logger and start turning the engine over. Try not to go real fast when the piston is near TDC, pressing on the TDC sensor.

The logger will stop recording when it has recorded enough data. Then you can analyze the data as outline in other sections of this manual.

Check our movie on our website under Support, then Movies, or on our youtube channel for more info.

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#### **Cam Checker Options, Length Sensor Inserts**

The Cam Checker uses relatively inexpensive length sensors to measure the cam lift. They have proven to be quite accurate, with accuracy in the +/- .002" range or better.

We check each sensor's calibration before shipping. Sometimes a sensor will be very accurate after the first .2" of travel from fully extended. If this sensor is used on a crate motor Quick Cam Checker bracket, we will install inserts on the end of the length sensor. This ensures the first .2" of sensor travel is never used. Shown below is how the inserts look and get installed. Spring tension keeps them in place.



If you get a system with the insert installed and the sensor is installed in a bracket as shown above, the Lift Sensor calibration numbers provided are for when the insert is installed. If you remove the sensor from this bracket and do not use the insert, the calibration will be slightly different. Sometimes Performance Trends will provide those calibration numbers, if they are significantly different.

Because the bracket shown above makes all the numbers MUCH more accurate, it is probably best to always use the numbers provided on page #1.

Calibration numbers NOT using the insert. (Only provided if they are significantly different.)

\_\_\_\_\_ Lift Sensor 1 (red) \_\_\_\_\_ Lift Sensor 2 (yellow)